

User Manual

TesiMod Hand-held Terminal HT06

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- HT06/0203/xxx/03xxx
- HT06/0803/xxx/00xxx
- HT06/0803/xxx/03xxx
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- HT06/0903/xxx/03xxx
- HT06/1603/xxx/00xxx
- HT06/1603/xxx/03xxx
- HT06/1803/xxx/00xxx
- HT06/1803/xxx/03xxx

with external download- / upload interface

Version	Date	Modifications
1	11.11.1999	First Edition
2	16.10.2000	Interface Variants Enlarged
3	19.01.2006	External Download- / Upload Interface

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

1.1.1 General Symbols

**Danger**

This symbol is used to refer to instructions which, if ignored or not carefully followed could result in personal injury.

**Note**

This symbol indicates application tips or supplementary notes.

**Reference to source of information**

This symbol refers to detailed sources of information on the current topic.

1.1.2 Specific Symbols

The following symbols indicate specific dangers which could result in damage to equipment or personal injury or even up to the death of the operator.

**Danger - Electric Shock****Danger - Corrosive****Danger - Toxic****Danger - Explosive****Danger - Fire****Danger - Infrared Light****Danger - Electrostatic Charge**

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The device is designed for use in the industry.
- The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
- The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.



This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

1.4 Target Group

All configuration, programming, installation, commissioning, operating and maintenance work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers, etc.).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

The operating personnel must have been trained in handling the controller and be familiar with the operating instructions.

The installation, commissioning and maintenance personnel must have an education which entitles them to work on automation systems.

2 Design and Commissioning

2.1 Unpacking the Device

Unpack all parts carefully and check the contents for any visible damage in transit. Also check whether the shipment matches the specifications on your delivery note.

If you notice damages in transit or discrepancies, please contact our sales department immediately.

2.2 Mounting the Device

The operating device is optional equipped with a hook and a magnet. You can put the operating device to a suitable position with these mounting options.

2.3 Design

2.3.1 Front View with Dimensions



Figure 2-1 Front view with dimensions

2.3.2 Side View with Dimensions



Figure 2-2 Side View with Dimensions

2.4 Connecting the Device



Hazardous voltages can exist inside electrical installations that can pose a danger to humans. There is a risk of electric shock when touching live parts!



For information on the pin or core numbers for the supply voltage, please refer to the chapter "Device Interfaces".

The device is protected against polarity reversal. The device will not operate if the polarity is incorrect.

This device is in Protection Class I. To ensure safe operation, a safety extra-low voltage (SELV) according to DIN EN 61131 must be used for the supply voltage.

The device is equipped with either an open cable end or with an assembled 12 or 16 pin connector. The 16 pin connectors consist of the following components:

Angle Connector	Part-No. 7301500000
16 pin Insert for Pins	Part-No. 7003916101
Crimp pin	Part-No. 7010901001

To connect a device with a 16 pin connector, you need a suitable connector which consists of the following components:

Device Connector	Part-No. 7471500000
or	
Coupler Connector	Part-No. 7201500000
16 pin Insert for Female Crimp Connector	Part.-No. 7003916102
Female Crimp Connector	Part-No. 7010901002
or	
16 pin Insert for Soldering Connector	Part-No. 7001916104



Figure 2-3 16 pin device connector / pin diagram



Figure 2-4 16 pin coupler connector / pin diagram



The listed parts can be obtained from Hummel Metall- und Kunststofftechnik GmbH. The crimp pins must be processed with a crimping tool. The tool is also obtainable at Hummel Metall- und Kunststofftechnik GmbH.

2.5 Switching the Device on

After you applied the supply voltage, a system test is carried out during which the modules in the operating device are tested and initialized. All status LEDs are activated for a short time. A number of system and error messages can be output by the system test. If the application memory contains a valid project, the first mask, i.e. the „Start mask“ or the mask defined in the TSwin language parameters as the Start-up mask appears on the display. A beep also sounds by the integrated loudspeaker.

The „Start mask“ is displayed for 5 seconds. This is a fixed time setting. After this time has elapsed, the „Main mask“ or the mask defined in the language parameters as the Main mask appears on the display. This is the first mask of the operator guidance.

When you touch the display while the „Start mask“ is displayed, the „Setup mask“ appears. In this mask you define the parameters for the interfaces and the operating device.

2.6 Identification

You can identify the operating device by the nameplate on the rear.

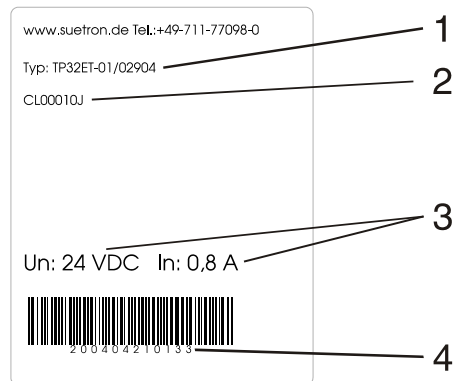


Figure 2-5 Nameplate (example)

- 1 Order Number
- 2 Firmware Version (Version on Delivery)
- 3 Voltage and Current
- 4 Serial Number

Depending on the size of the display, you will be able to read various types of information as the operating device is initialized: clock frequency, application memory size, current firmware version, TSwin version, project name, time, date, number of compilation runs and a random number.



Because the initialization mask is visible only for a few seconds there is a possibility to represent this mask for a longer time period.

1. Hold down an arbitrary key at the operating device to generate an error message.
2. Read the firmware version now.
3. Release the key to complete the initialization procedure of the operating device.

3 Control and Display Elements

3.1 Keyboard

The keys are positioned under an environmental-proof polyester foil. You project the operating principle of the keys in the programming software.

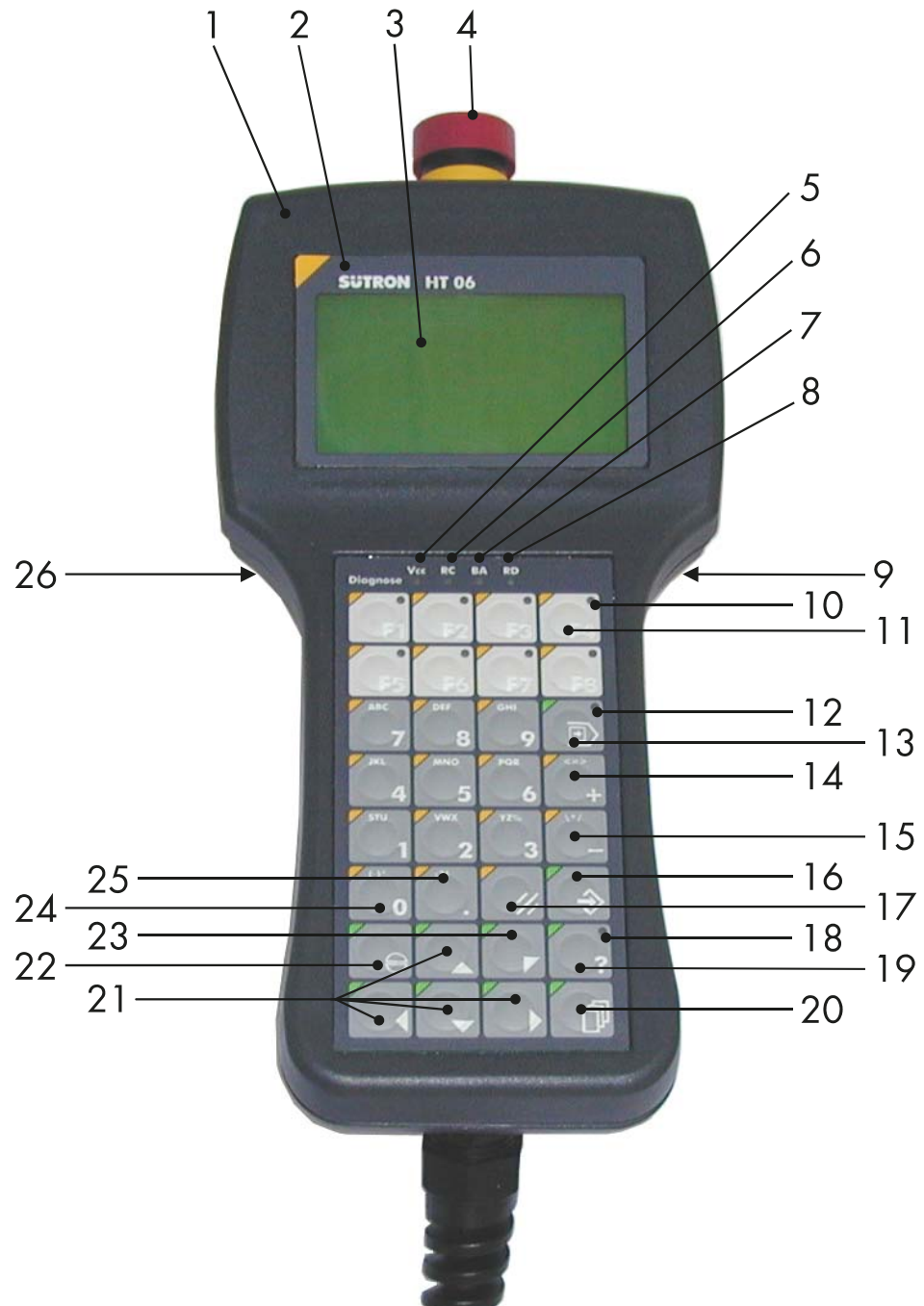
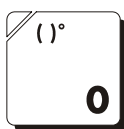


Figure 3-1 Front view

1. Enclosure
2. Nameplate
3. Display
4. Emergency Stop Button (Option)
5. Diagnostics LED Vcc
6. Diagnostics LED RC
7. Diagnostics LED BA
8. Diagnostics LED RD
9. Right Push-button on the Side (Option)
10. Status LED Function Keys F1 to F8
11. Function Keys F1 to F8
12. Status LED Data Release
13. Special Key Data Release
14. Editing Key Plus
15. Editing Key Minus
16. Special Key Enter
17. Special Key Delete
18. Status LED Help
19. Special Key Help
20. Control Key Page Down
21. Cursor Keys Right, Left, Up, Down
22. Special Key Acknowledge
23. Cursor Key Home
24. Editing Key 0 to 9, Alphabet
25. Editing Key Decimal Point
26. Left Push-button on the Side (Option)

3.1.1 Editing Keys



The key **0 and () °** is used for changing data in the editor. The (,) and ° characters can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **1 and STU** is used for changing data in the editor. The characters S, T and U can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **2 and VWX** is used for changing data in the editor. The characters V, W and X can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **3 and YZ%** is used for changing data in the editor. The characters Y, Z and % can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **4 and JKL** is used for changing data in the editor. The characters J, K and L can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **5 and MNO** is used for changing data in the editor. The characters M, N and O can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **6 and PQR** is used for changing data in the editor. The characters P, Q and R can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **7 and ABC** is used for changing data in the editor. The characters A, B and C can be entered when configuring the **Shift** or **ShiftCase** system variables.



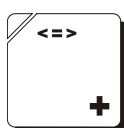
The key **8 and DEF** is used for changing data in the editor. The characters D, E and F can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **9 and GHI** is used for changing data in the editor. The characters G, H and I can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **Decimal point and :?!** is used for changing data in the editor. The characters :, ? and ! can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **Plus and <=>** is used for changing data in the editor. The characters <, = and > can be entered when configuring the **Shift** or **ShiftCase** system variables.



The key **Minus and */** is used for changing data in the editor. The characters \, * and / can be entered when configuring the **Shift** or **ShiftCase** system variables.

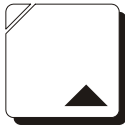
3.1.2 Control Keys



The key **Cursor left** can be programmed to directly select adjacent I/O masks. In the editor, it moves the cursor within a variable to the left by one character (character selection).



The key **Cursor right** can be programmed to directly select adjacent nodes and I/O masks. In the editor it moves the cursor one character to the right (character selection).



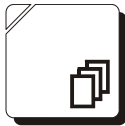
The key **Cursor up** can be programmed to directly select adjacent nodes and I/O masks. In the editor it moves the cursor up one variable (variable selection).



The key **Cursor down** can be programmed to directly select adjacent I/O masks. In the editor, it moves the cursor downwards to the next variable (variable selection).



The key **Cursor home** can be programmed to directly select higher-level nodes and I/O masks. In the editor it returns the cursor to the first input variable position.



The key **Page** is used to page through tables, recipes and messages. The functionality corresponds to the system variable TabPgDn. The key allows data content towards the bottom of the table to be viewed.

3.1.3 Special Keys



The key **Help** always displays the current help text (online help). The help key LED flashes when a system message is pending. The system message is always displayed in plain-text.



The key **Data Release** is used to switch from the menu into the editor. The integrated LED lights up in the editing mode if the external data release has been set. When the Data Release key is pressed within the editor, the editing mode is exited.



The key **Enter** is used to conclude data entry. When pressed while in the Startup Mask, the key switches into the Setup Mask.



The key **Delete** deletes the character beneath the cursor in the editor. Removes the selected messages from the data memory.



The key **Acknowledge** is used as acknowledge key for the message system.

3.1.4 Function Keys



The function of the function keys is freely assignable (with soft key functions). The function keys can be used either as direct keys for menu control or for triggering a function in the controller.

3.2 Diagnostics LEDs

Different diagnosis LEDs are at the operating device.:

Table 3-1 Diagnostics LEDs

Designation	Color	Function
Vcc	Green	Voltage Monitoring



The Diagnostics -LEDs RC, BA and RD are used with INTERBUS, PROFIBUS-DP and MPI interfaces. The functions of these LEDs are described in the chapter of the corresponding interface

3.3 User Mode Switch



When opening and closing the operating device, you must take care not to damage the seal and make sure that it always sits in the slot provided.



Electrostatic discharge can damage electronic components! **Observe the ESD protective measures!**

The user mode switch is positioned at the bottom right in the keyboard circuit board in the top shell of the operating device. To operate the user mode switch, proceed as follows:

1. Disconnect the operating device from the supply voltage.
2. Remove the screws on the rear of the housing and lift off the housing.
3. Set the desired operating mode (see table).
4. After setting the operating mode, place the housing rear panel back onto the device.
5. Carefully screw the screws tightly into the rear panel of the housing again.
6. Connect the operating device with the supply voltage.

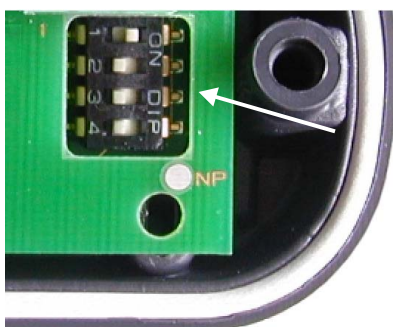


Figure 3-2 Position of user mode switch



The switch positions for ON or OFF are printed onto the termination switch.

Table 3-2 User mode switch

S1	S2	S3	S4	Operating Mode
I	X	–	–	Standard mode with PLC (default upon delivery)
I	X	I	–	Standard mode without PLC
I	–	–	I	Activate download (deletes application memory) and default contrast / default brightness setting
I	–	I	I	Activate upload

Legend for table:

I = Switch ON

– = Switch OFF

X = Any switch position

3.4 Stop Push-button / Emergency Stop Button

The device can be fitted with an optional STOP push-button or an emergency stop button.

The STOP push-button on the operating device ensures that the system to be monitored is shut down safely in accordance with EN 60204-1:1997, Paragraph 9.2.5.3. The stop function can be a Category 0, 1 or 2 stop according to EN 60204-1:1997, Paragraph 9.2.2 and must be defined according to the risk assessment.

Therefore, the stop function of the operating device can be used for a safe machine stop as well as for looping into the emergency stop circuit of the system to be monitored.

The signals of the STOP push-button use different circuits in the two versions of the linkbox. In the case of the linkbox with an emergency stop function, the signals control the stop circuit or emergency stop circuit of the system to be monitored. If no hand-held operating device is connected, the stop circuit or emergency stop circuit, respectively, is closed. In the linkbox without an emergency stop function, on the other hand, the signals of the stop circuit or emergency stop circuit are sent via the STOP push-button. If no hand-held operating device is connected, the stop circuit or emergency stop circuit, respectively, of the system to be monitored is open.

The term "stop looping" has the following meaning: The stop circuit or emergency stop circuit, respectively, of the system to be monitored is looped through the linkbox and not interrupted, irrespective of whether the hand-held operating device is connected to the linkbox (and the STOP push-button has not been operated) or not. This functionality is only available with the linkbox with an emergency stop function.

**Warning!**

If using a hand-held operating device with an emergency stop button, you must ensure that the connecting cable is securely installed.

A hand-held operating device that is not connected to the machine must be stored out of sight of the user!

Bear in mind that the nearest emergency stop will be activated in the event of danger. If it does not work because it is not connected, this could have fatal consequences!

**Warning!**

If the hand-held operating device is equipped with a STOP push-button but it is not connected to the linkbox, a stop can not be triggered using the hand-held operating device – the STOP push-button of the hand-held operating device is ineffective! Install stationary emergency stop buttons that are available at all times on the system to be monitored.

**Warning!**

If the stop circuit has been implemented as a Category 0 or 1 stop, the stop function must be effective regardless of the operating mode. A Category 0 stop must have priority. The releasing of the STOP push-button must NOT lead to hazardous conditions (also see EN 60204-1:1997 Chapter 9.2.5.3).

The stop function is not a substitute for safety devices.

3.5 Push-button

Optionally one push-button each is on the right and left side of the operating device. It is possible to start different orders or conditions at the machine with these push-buttons.



The connection must be carried out with little induction.

3.6 Display



Danger - Toxic!

If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!



Danger - Corrosive!

If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

The operating device is equipped with a LC-Display.

3.6.1 Setting the Contrast

To be able to set the contrast, you need to use the programming software to setup the system variable **LcdContrast** in a screen of your choice.



To do so, follow the instructions listed in the programming software's help topic "How do I specify the contrast / brightness setting for the operating device".

In the programming software, enter the following values as lower and upper limits for the representation type.

Table 3-3 Values for representation type

System Variable	Lower Limit	Upper Limit	Default Setting
LcdContrast	- 25	+ 125	+ 25



If you do not configure the system variable **LcdContrast**, the default setting is used when the device is initialized.



Adjust the contrast to the surrounding conditions at reached operating temperature to be able to read the display optimally.

If you did set up the system variable, you can set the contrast as follows. Open the screen where you set up the system variable and:

1. Press the Data Release key if the data release is not automatically active.
2. Enter a new value for the contrast. To do so, use the keys Plus and Minus.
3. Press the Enter key.
4. Finally press the Data Release key.

The new contrast setting becomes effective immediately after the Enter key is pressed. If necessary, repeat steps 2 and 3 until you are satisfied with the contrast.

3.6.2 Default Contrast Setting

If the contrast setting is such that it is no longer possible to read the masks, you can use the user mode switch to reset the contrast to the default value.



For the table with the switch positions of the user mode switch, see chapter "User Mode Switch".



The switch position for the default contrast is identical with the „Activate download via hardware“. The contrast is reset before a corresponding message is displayed. The warning will be displayed in a legible manner.

To restore the default contrast / brightness:

1. Switch the device off.
2. Set the switches S1 and S4 of the user mode switch to ON.
3. Switch the device on again.
4. When the warning appears, switch the device off again.
5. Set switch S4 to OFF.
6. Then switch the device on again.

The application will not be lost.

3.6.3 Character Attributes

The following character attributes can be displayed on the device:

- Normal
- Flashing
- Underlined
- Inverse

3.6.4 Fonts

You are able to use the Windows character sets. Further you can use the font "Normal" and the font "Zoom" or create and use your own character sets.

4 Interfaces of the Device

The standard operating device is supplied with an open cable end. Optionally, the operating device can be equipped with an assembled 16 pin connector.

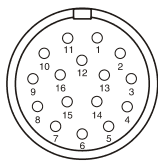


Figure 4-1 Pin diagram for 16 pin connector

The connecting cable is constructed of three components, respectively.

1. 3 x 0,5 mm² (not shielded) for supply voltage
2. 2 x 0,5 mm² and 6 x 0,25 mm² (not shielded) for emergency stop button and the push-buttons
3. 5 x 0,25 mm² (shielded) for communication

Depending on the device variant, several interfaces are available:

Table 4-1 Device variants

Order Number	Available Interfaces					
	RS232c (Download / Upload)	RS232c	CAN	INTERBUS	MPI	PROFIBUS-DP
HT06/02xx/xxx/xxxxx	X	X	-	-	-	-
HT06/09xx/xxx/xxxxx	X	-	X	-	-	-
HT06/18xx/xxx/xxxxx	X	-	-	X	-	-
HT06/16xx/xxx/xxxxx	X	-	-	-	X	-
HT06/08xx/xxx/xxxxx	X	-	-	-	-	X

4.1 RS232 (Download / Upload)

The interface is only designed to be used for downloads and uploads because the interface is not electrically isolated.

To carry out a download or an upload, proceed as follows:

1. Carefully unscrew and remove the protective cap (see figure) of the download/upload interface.
2. Plug the cable onto the interface of the operating device.
3. Connect the other end of the cable with the serial interface of the PC.
4. Now carry out the download or upload.
5. After the download/upload is complete, remove the cable from the interfaces again.
6. Carefully tighten the protective cap for the download/upload interface again.



Figure 4-2 Position of download/upload interface

4.1.1 Pin Assignment

Connector in the operating device: 5 pin female connector - Binder series 702.

Table 4-2 Pin assignment of the RS232 interface

Pin	Designation	Function
1	TD	Transmitted Data
2	RD	Received Data
3	CTS	Clear to Send
4	RTS	Request to Send
5	GND	Ground



You can obtain an assembled cable directly from Sutron electronic.

4.2 RS232 (Communication)

The interface is suitable to establish a point-to-point connection.

4.2.1 Pin/Cable Assignment

Pin/cable assignment for open cable end or 16 pin device connector.

Table 4-3 Pin/cable assignment

Pin	Wire	ø mm ²	Design.	Function
-	Shield	-	-	Overall Cable Shield
1	RDBU	0,25	S	Push-button Left, Make Contact
11	PK	0,25	S	Push-button Left, Make Contact
2	WHGN	0,25	S	Push-button Right, Make Contact
12	OR	0,25	S	Push-button Right, Make Contact
3	BU	0,5	O	Emergency Stop Brake Contact
4	BN	0,5	O	Emergency Stop Brake Contact
5	WHYE	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
6	BNGN	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
8	BK	0,5	0 V	Supply Voltage 0 VDC
9	VT	0,5	+ 24 V	Supply Voltage 24 VDC
10	YE	0,5	(⏏)	Low-Noise Ground
7	GR	0,25	GND	Ground
13	WH	0,25	TD	Transmitted Data
14	BN	0,25	RTS	Request to Send
-	Shield	-	-	Shield Communication
15	RD	0,25	CTS	Clear to Send
16	GN	0,25	RD	Received Data
-	Shield	-	-	Shield Communication



Grey underlayed entries are only optionally available.



For operating devices with open cable ends, make sure to connect the shield with the protective ground.

4.3 CAN

The opto decoupled interface for CAN bus connections is available to integrate the device into a CAN structure. The CAN bus is a high speed bus in accordance with ISO-DIS 11898.

4.3.1 Pin/Cable Assignment

Pin/cable assignment for open cable end or 16 pin device connector.

Table 4-4 Pin/cable assignment

Pin	Wire	ø mm ²	Designation	Function
-	Shield	-	-	Overall Cable Shield
1	RDBU	0,25	S	Push-button Left, Make Contact
11	PK	0,25	S	Push-button Left, Make Contact
2	WHGN	0,25	S	Push-button Right, Make Contact
12	OR	0,25	S	Push-button Right, Make Contact
3	BU	0,5	O	Emergency Stop Brake Contact
4	BN	0,5	O	Emergency Stop Brake Contact
5	WHYE	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
6	BNGN	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
8	BK	0,5	0 V	Supply Voltage 0 VDC
9	VT	0,5	+ 24 V	Supply Voltage 24 VDC
10	YE	0,5		Low-Noise Ground
7	GR	0,25	GND	Ground
13	WH	0,25	CANH (OUT)	CAN_H Bus Line (Dominant HIGH)
14	BN	0,25	CANL (OUT)	CAN_L Bus Line (Dominant LOW)
-	Shield	-	-	Shield Communication
15	RD	0,25	CANH (IN)	CAN_H Bus Line (Dominant HIGH)
16	GN	0,25	CANL (IN)	CAN_L Bus Line (Dominant LOW)
-	Shield	-	-	Shield Communication



Grey underlayed entries are only optionally available.



For operating devices with open cable ends, make sure to connect the shield with the protective ground.

4.3.2 Termination

The operating device is configured as a participant. At use as last device you have to use a terminating resistor ($R_{Ab}=120\text{ ohms}$) between the wires WH and BN.

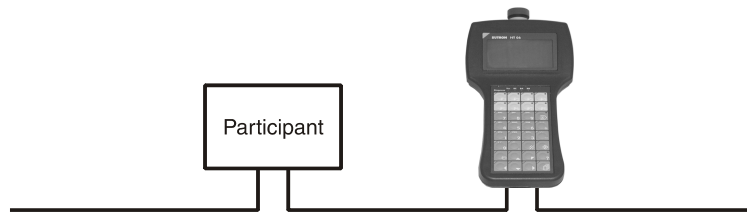


Figure 4-3 Operating device as participant

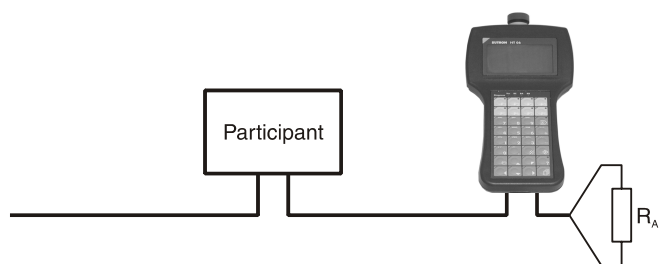


Figure 4-4 Operating device as last device

4.4 INTERBUS

The device can be integrated into the INTERBUS using the interfaces available for INTERBUS connections.

4.4.1 Pin/Cable Assignment

Pin/cable assignment for open cable end or 16 pin device connector.

Table 4-5 Pin/cable assignment

Pin	Wire	ø mm ²	Design.	Function
-	Shield	-	-	Overall Cable Shield
1	RDBU	0,25	S	Push-button Left, Make Contact
11	PK	0,25	S	Push-button Left, Make Contact
2	WHGN	0,25	S	Push-button Right, Make Contact
12	OR	0,25	S	Push-button Right, Make Contact
3	BU	0,5	O	Emergency Stop Brake Contact
4	BN	0,5	O	Emergency Stop Brake Contact
5	WHYE	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
6	BNGN	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
8	BK	0,5	0 V	Supply Voltage 0 VDC
9	VT	0,5	+ 24 V	Supply Voltage 24 VDC
10	YE	0,5		Low-Noise Ground
7	GR	0,25	GND	Ground
13	WH	0,25	DI1	Data Input
14	BN	0,25	/DI1	Data Input, Inverted
-	Shield	-	-	Shield Communication
15	RD	0,25	DO1	Data Output
16	GN	0,25	/DO1	Data Output, Inverted
-	Shield	-	-	Shield Communication



Grey underlayed entries are only optionally available.



For operating devices with open cable ends, make sure to connect the shield with the protective ground.

4.4.2 Termination



You only can use the operating device as last device.

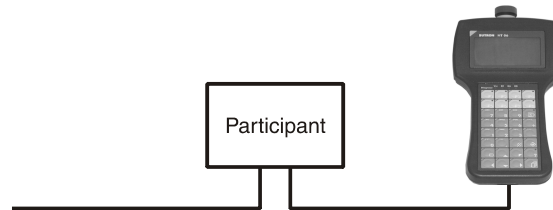


Figure 4-5 Operating device as last device

4.4.3 Diagnostics

There are diagnostics LEDs at the operating device. The LEDs show the states of the bus system.

The diagnostics LEDs on the operating device has the following functions:

Table 4-6 Functions of the INTERBUS diagnostics LEDs

Designation	Color	State	Function
RC	Green	On	Remote Bus Check
BA	Green	On	Bus Active
		Off	Bus Not Active
RD	Red	On	Remote Bus Inactive

4.5 MPI

The device can be integrated into a Siemens MPI bus structure using the interface available for Siemens MPI connections.

4.5.1 Pin/Cable Assignment

Pin/cable assignment for open cable end or 16 pin device connector.

Table 4-7 Pin/cable assignment

Pin	Wire	ø mm ²	Designation	Function
-	Shield	-	-	Overall Cable Shield
1	RDBU	0,25	S	Push-button Left, Make Contact
11	PK	0,25	S	Push-button Left, Make Contact
2	WHGN	0,25	S	Push-button Right, Make Contact
12	OR	0,25	S	Push-button Right, Make Contact
3	BU	0,5	O	Emergency Stop Brake Contact
4	BN	0,5	O	Emergency Stop Brake Contact
5	WHYE	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
6	BNGN	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
8	BK	0,5	0 V	Supply Voltage 0 VDC
9	VT	0,5	+ 24 V	Supply Voltage 24 VDC
10	YE	0,5		Low-Noise Ground
7	GR	0,25	DGND	Data Transmission Potential
13	WH	0,25	CNTR-N	Repeater Control Signal Minus
14	BN	0,25	nc	Not Connected
-	Shield	-	-	Shield Communication
15	RD	0,25	RxD/TxD-N	Received Data / Transmitted Data Minus
16	GN	0,25	RxD/TxD-P	Received Data / Transmitted Data Plus
-	Shield	-	-	Shield Communication



Grey underlayed entries are only optionally available.



For operating devices with open cable ends, make sure to connect the shield with the protective ground.

4.5.2 Cable



Any cable that conforms with the following parameters can be used:

Table 4-8 Cable characteristics MPI

Parameters	Value
Loop Resistance	110 Ohm/km
Capacitance	30 nF/km
Surge Impedance	150 Ohm

The maximum length of one segment is 50 m which cannot be exceeded. This 50 m applies from the first node to the last node in the segment.



For further information on the installation, please refer to the Siemens manual "SIMATIC S7-400 and M7-400 Programmable Controllers Hardware and Installation, 6ES7498-8AA03-8BA0".

4.5.3 Termination

The operating device is configured as last device. The termination is inside the device and can not be switched off. At operation as a participant you have to use repeaters.

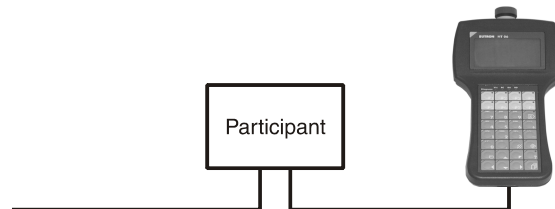


Figure 4-6 Operating device as last device

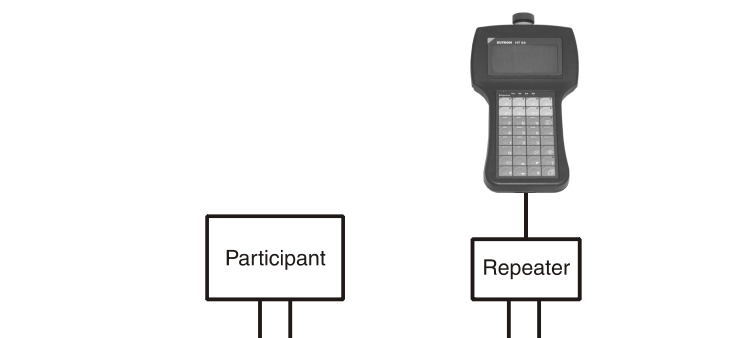


Figure 4-7 Operating device as participant with repeater

4.5.4 Diagnostics

There is a diagnostics LED at the operating device. The LED shows the state of the bus system.

The diagnostics LED on the operating device has the following function:

Table 4-9 Function of the MPI diagnostics LED

Color	State	Function
Green	On	Data exchange

4.6 PROFIBUS-DP

4.6.1 Pin/Cable Assignment

Pin/cable assignment for open cable end or 16 pin device connector.

Table 4-10 Pin/cable assignment

Pin	Wire	ø mm ²	Designation	Function
-	Shield	-	-	Overall Cable Shield
1	RDBU	0,25	S	Push-button Left, Make Contact
11	PK	0,25	S	Push-button Left, Make Contact
2	WHGN	0,25	S	Push-button Right, Make Contact
12	OR	0,25	S	Push-button Right, Make Contact
3	BU	0,5	O	Emergency Stop Brake Contact
4	BN	0,5	O	Emergency Stop Brake Contact
5	WHYE	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
6	BNGN	0,25	O/S	Emergency Stop Brake Contact / Make Contact (Optional)
8	BK	0,5	0 V	Supply Voltage 0 VDC
9	VT	0,5	+ 24 V	Supply Voltage 24 VDC
10	YE	0,5		Low-Noise Ground
7	GR	0,25	DGND	Data Transmission Potential
13	WH	0,25	CNTR-P	Repeater Control Signal Plus
14	BN	0,25	nc	Not Connected
-	Shield	-	-	Shield Communication
15	RD	0,25	RxD/TxD-N	Received Data / Transmitted Data Minus
16	GN	0,25	RxD/TxD-P	Received Data / Transmitted Data Plus
-	Shield	-	-	Shield Communication



Grey underlayed entries are only optionally available.



For operating devices with open cable ends, make sure to connect the shield with the protective ground.

4.6.2 Cable



Any PROFIBUS-DP-approved cables specified in the EN 50170 as cable type A can be used.

Table 4-11 Cable characteristics PROFIBUS

Parameters	Value
Impedance	136 to 165 Ohm
Capacitance	< 30 pf/m
Loop Resistance	110 Ohm/km
Wire Gauge	0.64 mm

The maximum cable length depends on the baud rate (DIN EN 19245 Part 3).

Table 4-12 Baud rate PROFIBUS-DP

Baud Rate	Cable Length
187.5 kBit/s	1000 m
500 kBit/s	400 m
1500 kBit/s	200 m
3000 to 12000 kBit/s	100 m

4.6.3 Termination

The operating device is configured as last device. The termination is inside the device and can not be switched off. At operation as a participant you have to use repeaters.

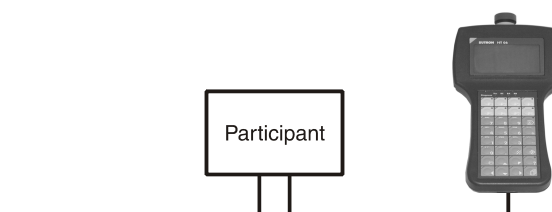


Figure 4-8 Operating device as last device

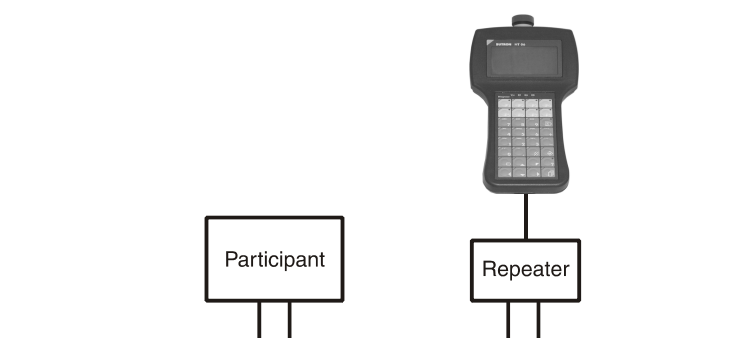


Figure 4-9 Operating device as participant with repeater

4.6.4 Diagnostics

There is a diagnostics LED at the operating device. The LED shows the state of the bus system.

The diagnostics LED on the operating device has the following function:

Table 4-13 Function of the PROFIBUS-DP diagnostics LED

Designation	Color	State	Function
BA	Green	On	Data exchange

4.7 Shielding D-SUB Connectors

You must shield D-SUB connectors as follows:

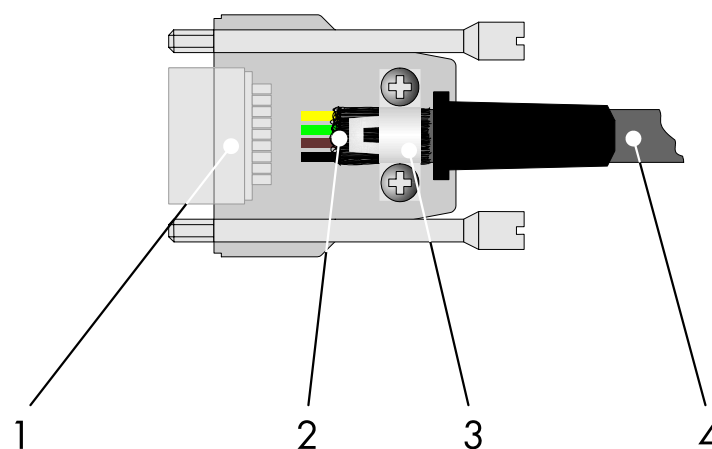


Figure 4-10 Shielding D-SUB connectors

- 1 D-SUB connector
- 2 Shield
- 3 Cable clip
- 4 Cable

The shield must be folded back into a flat position over the cable sheath.

When fastening the cable with the cable clip, as much of the shielding as possible must be in contact with the housing and sufficient strain relieve must be ensured.

5 Maintenance and Servicing

5.1 Maintenance Interval

The following maintenance intervals are recommended for this operating device:

Table 5-1

Maintenance work	Interval
Changing the Battery	4 Years

5.2 Front Panel

Only use a damp cloth to remove any dirt from the front panel.

5.3 Fuse



The semiconductor fuse cannot be replaced!

A semiconductor fuse is used to protect the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20 °C (68 °F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

5.4 Battery

The built-in battery preserves the data in the CMOS-RAM and supplies the real-time clock. The minimum battery life is 5 years, even under unfavorable operating conditions. When the battery runs down, the message „Change battery“ is generated automatically.

We recommend you change the battery approximately every 4 years as part of the regular maintenance work. A prepared battery including connector can be obtained directly from Sutron electronic.

If the „Change battery“ message is detected too late, e.g. the real-time clock stopped or shows the wrong date, data in the CMOS-RAM may have already been lost. For this reason, after changing a battery, always check data such as passwords that can be modified, parameters in the system variables, recipe data sets and entries in the message system.

5.4.1 Changing the Battery



Batteries must only be changed by authorized and trained experts!



For changing the battery you may only use replacement batteries of Sutron electronic.



Electrostatic discharge can damage electronic components! **Observe the ESD protective measures!**



Do not throw lithium batteries into fire, do not heat to 100 °C or higher and do not recharge. **Danger - Explosive!**



Do not open lithium batteries. **Danger - Toxic!**



When opening and closing the operating device, you must take care not to damage the seal and make sure that it always sits in the slot provided.

To ensure that the data in the CMOS-RAM and the time are preserved, it is possible to change the battery under operating voltage. Please note the safety notes!

1. Remove the screws on the rear of the housing and lift off the housing.
2. Remove the cable fastener which secures the battery.
3. Disconnect the battery connector and remove the dead battery.
4. Plug in the cable for the new battery.
5. Use a cable fastener to attach the new battery to the plastic support.
6. Place the rear panel back onto the device.
7. Carefully screw the screws tightly into the rear panel.

5.4.2 Battery Disposal



To prevent short circuitry in the collection boxes, insulate the poles of each battery with insulation tape or put each single battery into a plastic bag.

You must always return old batteries to a dealer or to a returns depot set up for this purpose by the public waste disposal body or a licensed battery dealer for recycling. Only dispose of dead batteries in public or commercial collection boxes. The battery is drained when the message „Change battery“ appears on the display of the device.

6 Technical Data

Keyboard	
Type	Membrane Keyboard
Number of Keys	32 Keys
Switching Cycles	Approx. 6 Million
Actuator Travel	0.4 mm (0.016")
Key Area (Embossment)	13 mm x 13 mm (0.512" x 0.512")
Display Elements	4 Diagnostics LEDs 10 Status LEDs

Emergency Stop Button	
According to EN 418	
Type	Rafi RAFIX 16 1.30074.122
Lifetime	3×10^4 Switching Cycles
Switching Element	Rafi RAFIX 16 Universal Switching Element 2NC or Optional 1NC + 1NO
Maximum Switching Current	250 mA 30 VAC, 250 mA 42 VDC
Lifetime	5×10^5 Switching Cycles

Push-button	
Type	APEM Series IS
Mechanical Lifetime	1×10^6 Switching Cycles
Switching Element	1NO
Maximum Switching Current with Ohmic Rated Current	400 mA 30 VAC, 100mA 50 VDC
Electrical Lifetime (Full Load)	5×10^5 Switching Cycles

Display	
Type	LCD
Resolution	126 x 64 Pixels
Reading Angle	90°
Default Brightness Setting	By User Mode Switch
LCD Lifetime	100,000 h
Half-Life Backlighting	100,000 h

Display	
Lines	8
Characters/Line	21
Display Area (H x W)	40 mm x 72 mm (1.575" x 2.835")

Electrical Data	
Supply Voltage	24 V DC (SELV in Accordance with DIN EN 61131)
Residual Ripple	10% Maximum
Minimum Voltage	19.2 V
Maximum Voltage	30.2 V
Power Consumption (Field Bus Device)	0.25 A
Connected Load	6 W
Fuse	Semiconductor Fuse, Self-resetting
Protection Against Polarity Reversal	Integrated

Standard Interfaces	
Variable Baud Rates and Data Formats	
TTY / 20 mA	According to CL 2 and DIN 66 348 T1 Transmission Length: 0 - 1000 m (3280.84 ft.), Twisted Pair, Shielded Electrically Isolated
RS485	According to DIN 66259-4 Transmission Length: 0 - 1200 m (3937.01 ft.), Twisted Pair, Shielded Electrically Isolated
RS232c	According to DIN 66259 T1, CCITT V.28 Transmission Length: 0 - 15 m (49.21 ft.), Layer-stranded, Shielded Communication: Electrically Isolated Download / Upload: Not Electrically Isolated

Field Bus Interfaces	
Variable Baud Rates and Data Formats	
CAN	According to ISO 11898 Electrically Isolated
DeviceNet	According to ISO 11898 Electrically Isolated
INTERBUS	Not Electrically Isolated

Field Bus Interfaces	
SUCOnet K	Electrically Isolated
MPI	Electrically Isolated
PROFIBUS-DP	Electrically Isolated

Central Unit	
Central Unit	Z84
Clock Frequency	10 MHz
Other Characteristics	Watchdog Timer, Real-Time Clock, Temperature Compensation of the Display, Battery Monitoring

Memory	
Application Memory	256 KByte Flash
RAM	128 KByte Static CMOS-RAM, Battery-Backed

Connection System	
Circular Connector M23, 16 pin	

Connection Cable	
Diameter	10.8 mm +/- 0.35 mm (0.425 +/- 0.014")
Weight	Approx. 172 g/m
Bending Radius fix lay	4 x Cable Diameter
Bending Radius loose lay	10 x Cable Diameter
UL Approved According to Style 20233, 80 °C (176 °F), 300V	

Environmental Conditions	
Operation	0 °C to 50 °C
Storage, Transport	-10 °C to 70 °C
Relative Air Humidity for Operation and Storage	10% to 95%, No Condensation
Application Area	Degree of Pollution 2, Overvoltage Category II

Standards and Guidelines	
Interference Immunity	EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6
Emitted Interference	EN 50081-1 Tab. A1 EN 50082-2 EN 55011 (PROFIBUS-DP and MPI: Limit Value Class A) EN 55022 (PROFIBUS-DP and MPI: Limit Value Class A)
Equipment Requirements	EN 61131
Storage and Transportation	EN 61131 Part 2
Power Supply	EN 61131 Part 2
Electromagnetic Compatibility	89/336/EEC (Including all Applicable Amendments)
Degrees of Protection	EN 60529
Impact Load, Shocks	EN 60068 Part 2-27
Sinusoidal Vibrations	EN 60068 Part 2-6
Corrosion Protection	IEC 60068
Emergency Stop Button	EN 418



This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

Housing	
Type	ROSE Beluga 2200, Polyamide
Color	RAL7021
Impact Resistance	> 7 Nm to DIN 50014
Flammability	V2 to UL94
Measures (L x W x D)	Without Emergency Stop Button: Approx. 229 mm x 116.5 mm x 125 mm (9.016" x 4.587" x 4.921") With Emergency Stop Button: Approx. 253 mm x 116.5 mm x 125 mm (9.961" x 4.587" x 4.921")
Degree of Protection	IP54
Total Weight	Approx. 415 g without Cable (Cable Weight Approx. 172 g/m)

7 Ordering Data

Table 7-1 Accessories

Description	Part Number
5 Pin Download Cable	88311.020
USB-RS232 Converter for Downloads (In Connection With 88311.020 Only)	81215.000
Battery, Assembled With Cable And Connector	66694.000
Device Connector (Front Panel Mounting) 16 Pin Insert With Soldering Contacts	57320.000 57323.000

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